

MTH -301
COMPUTATIONAL TECHNIQUES

UNIT I MATRICES

Eigenvalues and Eigenvectors of a real matrix , Characteristic equation , Properties of Eigenvalues and eigenvectors , Cayley-Hamilton Theorem , Diagonalization of matrices , Reduction of a quadratic form to canonical form by orthogonal transformation

UNIT II INFINITE SERIES

Sequences , Convergence of series , General properties , Series of positive terms , Tests of convergence (Comparison test, Integral test, Comparison of ratios and D’Alembert’s ratio test) , Alternating series , Series of positive and negative terms , Absolute and conditional convergence , Power Series , Convergence of exponential, logarithmic and Binomial Series.

UNIT III FUNCTIONS OF SEVERAL VARIABLES

Limits and Continuity , Partial derivatives , Homogeneous functions and Euler’s theorem , Total derivative , Differentiation of implicit functions , Change of variables , Partial differentiation of implicit functions , Taylor’s series for functions of two variables .
Errors and approximations , Maxima and minima of functions of two variables

UNIT IV IMPROPER INTEGRALS

Improper integrals of the first and second kind and their convergence , Evaluation of integrals involving a parameter by Leibnitz rule – Beta and Gamma functions , Properties , Evaluation of integrals using Beta and Gamma functions , Error functions.

UNIT V MULTIPLE INTEGRALS

Double integrals , Change of order of integration , Area enclosed by plane curves , Triple integrals , Volume of Solids , Change of variables in double and triple integrals , Area of a curved surface.

TEXT BOOKS :

1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 40th Edition, 2007.
2. Ramana B.V., “Higher Engineering Mathematics”, Tata McGraw Hill Co. Ltd.,

ECC-302

Electronic Devices And Circuits

Unit I : Types of Semiconductors :-Intrinsic and Extrinsic, p-type and n-type, energy band diagrams, majority and minority carriers, charge density in semiconductor, generation and recombination of charges, process of diffusion ,diffusion and drift currents, Hall effects and its applications. p-n junction, depletion layer, potential barrier ,electric field, forward and reverse biased junction, current components in p-n diode.

Unit II : Types of Semiconductor Diode: Ideal & Practical diode equivalent circuit & frequency response, graphical analysis of diode circuits, Signal diodes, Power Diode, Zener diode, Varactor diode, Schottky diode, PIN diode,Tunnel diode, Photo diode. Direct tunneling equivalent circuit, Tunnel diode.

Unit III: Applications of Diode : P-N junction diode as rectifier, clipper and clamper ,The Load line concept, The Pieces wise linear diode modal, Clipping circuits, Clipping at two independent levels, Comparators, Sampling Gate, Rectifiers, Other full wave circuits, Capacitor filter additional diode circuits.

Unit IV : Bipolar Junction Transistor - Construction, basic operation, current components and equations,. CB,CE and CC-configuration, input and output characteristics, Early effect, region of operation, active, cutoff and saturation region Ebers-Moll model, , power dissipation in transistor , Photo transistor, Uni junction Transistor (UJT) : Principle of operation, characteristics.

Unit V : FET construction- Construction, n channel and p channel, characteristics, parameters, Equivalent model and voltage gain, Enhancement and depletion MOSFET and its Characteristics, analysis of FET in various configuration.

References:

1. Boylestad and Nashelsky: Electronic Devices and Circuit Theory, Pearson Education
2. Millman and Halkias: Integrated electronics, TMH
3. Graham Bell: Electronic Devices and Circuits, PHI
4. Sendra and Smith: Microelectronics, Oxford Press.
5. Donald A Neamen: Electronic Circuits Analysis and Design, TMH

List of Experiment's:

1. V-I characteristics of various Diodes (p-n, Zener, Varactor, Schottky, Tunnel, Photodiode etc)
2. Characteristics of Transistors (BJT and FET)
- 3 Applications of diodes and Design of various clipping and clamping circuits
- 4 Design half & full wave rectifier
- 5 Design & Analysis of transistor amplifier in CE, CB & CC configuration.
- 6 Design & Analysis of JFET Amplifier.
- 7 Design & Analysis of MOSFET Amplifier.

ECC-303
Digital Circuits

Unit-I :Number Systems and codes: Decimal, binary, octal, Hexadecimal, Excess 3, Gray ASCII, decimal number system and conversion , binary weighted codes, signed numbers, 1s and 2s complement codes, Binary arithmetic, Boolean Algebra: Binary logic functions , Boolean laws, truth tables, associative and distributive properties, DeMorgan's theorems, realization of switching functions using logic gates.

Unit-II : Combinational Logic: AND, OR, NOT, XOR, XNOR, NAND, NOR, realization of Boolean function using universal gates. Half and full adder, half and full subtractor, Series and parallel adder, BCD adders, .Decoders, Encoders, multiplexers and de-multiplexer

Unit-III : Flip-Flops: R-S, Clocked R-S, T, D, J-K, race around problem, Master-slave J-K., State and Excitation Tables ,Shift registers and counters :synchronous and asynchronous counters, Binary ripple counter, up-down counter, Johnson and ring counter. Analysis and Design of Sequential Circuits

Unit-IV : Semiconductor memories: Organization and construction of RAM, SRAM, DRAM, RAM,ROM, PROM, EPROM, EEPROM, PAL and PLAs etc

Unit-V : Logic families: RTL, DTL, TTL, ECL, IIL, PMOS, NMOS and CMOS logic etc. Interfacing between TTL and MOS, vice-versa.

References:

1. M. Mano : Digital Logic and Computer Design, Pearson Education
2. W.H. Gothman : Digital Electronics, PHI.
3. Millman and Taub : Pulse, Digital and Switching Waveforms, MGH
4. Salivahanan and Ari Vahagan : Digital Circuits and Design, Vikas Publishing House
5. Leach and Malvino : Digital Principles and Applications, TMH

List of Experiments:

1. To test and study of operation of all logic Gates for various IC's.
2. Implementation of AND, OR, NOT, NOR, X-OR and X-NOR Gates by NAND and NOR Universal gates.
3. Binary Addition by Half Adder and Full Adder circuit.
4. Binary Subtraction by Half Subtractor and Full Subtractor circuit.
5. Design a BCD to Excess-3 code converter.
6. Verification of the Demorgan's Theorem.
7. Multiplexers/Demultiplexer based Boolean function realization.

ECC-304

Network Analysis and Synthesis

Unit I : Network Theory : Circuit Theory Concepts – Mesh and Node Analysis; Network Star – Delta Transformation. Steady State Analysis of AC Circuits- Sinusoidal and Phasor Representation of Voltage and Current, Single Phase AC circuit behavior of R, L & C, Combination of R, L & C in series and parallel. Network Topology : Graph of a Network, definitions, tree, co tree, link, basic loop and basic cut set.

Unit II : Network Theorems (Applications to ac networks): Super-position theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, Reciprocity theorem. Millman's theorem, compensation theorem, Tellegen's theorem.

Unit III: Circuit Analysis : Natural response and forced response, Transient response and steady state response for arbitrary inputs (DC and AC), Evaluation of time response both through classical and Laplace methods.

Unit IV : Network function & Two port networks : concept of complex frequency, Network & Transfer functions for one port & two ports, poles and zeros, Necessary condition for driving point & transfer function. Two port parameters – Z,Y, ABCD, Hybrid parameters, their inverse & image parameters, relationship between parameters, Interconnection of two ports networks, Terminated two port network.

Unit V : Network Synthesis: Positive real function, definition and properties; Properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point admittance functions using Foster and Cauer first and second forms.

References:

- 1 M.E. Van Valkenburg, "Network Analysis", Prentice Hall of India
- 2 A.Chakrabarti, "Circuit Theory" DhanpatRai& Co.
- 3 C.L Wadhwa, "Network Analysis and Synthesis" New Age International Publishers, 2007.
- 4 D.RoyChoudhary, "Networks and Systems" Wiley Eastern Ltd.
- 5 Donald E. Scott: "An Introduction to Circuit analysis: A System Approach" McGraw Hill

List of Experiments:

1. To determine node voltages and branch currents in a resistive network.
2. To obtain Thevenin's equivalent circuit of a resistive network.
3. To obtain transient response of a series R-L-C circuit for step voltage input.
4. To Verify Thevenin Theorem.
5. To Verify Superposition Theorem.
6. To Verify Reciprocity Theorem.
7. To Verify Maximum Power Transfer Theorem.
8. To Verify Millman's Theorem.
9. To Determine Open Circuit parameters of a Two Port Network.

ECC-305
Signals and System

Unit I- Introduction to Signal & Systems: Signals, classification of signals, basic continuous time and discrete time signals, continuous LTI, discrete LTI systems , impulse and step functions, impulse response stability, linearity, stability, time invariance, Eigen values and Eigen functions, discrete convolution, properties of discrete and continuous LTI systems ,systems described by difference and differential equations.

Unit II- Fourier Analysis of Continuous Time Signals and Systems: Fourier series, Fourier series representation of continuous periodic signal & its properties, Fourier transform and its properties,Parseval's theorem, frequency response of LTI systems.

Unit III- Fourier Analysis of Discrete Time Signals & Systems: Discrete-time Fourier series, discrete time Fourier transform (including DFT) and properties, frequency response of discrete time LTI systems, continuous time Fourier transform for periodic and non-periodic signals, properties of CTFT.

Unit IV- Laplace & Z-Transform Transform: Laplace transform and its inverse: definition, existence conditions, region of convergence and properties, application of Laplace transform for the analysis of continuous time LTI system, Z-Transform, properties of Z-transform inversion of Z-transform, two dimensional Z- transform, convergence of Z-transform, region of convergence and properties, application of Z-transform for the analysis of discrete time LTI systems, solving eq. using Z transform.

Unit V- State Space Analysis: Concept of state, state space representation discrete time LTI systems,state space representation of continuous time LTI systems ,solutions of state equation for discrete time LTI systems , solutions of state equation for continuous time LTI systems ,FFT.Sampling: Sampling theorem, ideal & real sampling, reconstruction of signal from its samples.

References:

1. Alan V. Oppenheim, Alan S. Willsky and H. Nawab, Signals and Systems, Prentice Hall, 1997
 2. Simon Haykin, Communication Systems, 3rd Edition, John Wiley, 1995.
 3. Signals & Systems, 2nd Edition, by Alan Oppenheim, Alan Wilsky, S. Nawab. Prentice Hall, 1997.
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ECC-306

Instrumentation and Control

Unit I : Philosophy of Measurement- Methods of measurement, Measurement system, Classification of instrument systems, Characteristics of instruments & measurement systems, Errors in measurement & its analysis, Standards. Analog Measurement of Electrical Quantities- Electrodynamics, Thermocouple.

Unit II Instrument Transformers: CT and PT; their errors, Applications of CT and PT in the extension of instrument range, Introduction to measurement of speed, frequency and power factor.

Unit III Measurement of Parameters- Different methods of measuring low, medium and high resistances, measurement of inductance & capacitance with the help of AC Bridges, Q meter.

Unit IV Introduction to Control System and Their Classification : Differential equations of systems, linear approximation, laplace transform and transfer function of linear system, model of physical system (electrical, mechanical and electromechanical), block diagram, signal flow graph, mason's gain formula.

Unit V Time Domain Analysis: Representation of deterministic signals, first order system response, s - plane root location and transient response, impulse and step response of second order systems, performance characteristics in the time domain, effects of derivative and integral control, steady state response, error constant, generalized definition of error coefficients, concepts of stability, Routh Hurwitz criterion.

References:

1. E. W. Golding & F. C. Widdis, "Electrical Measurement & Measuring Instrument", A. W. Wheeler & Co. Pvt. Ltd. India
2. A. K. Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons, India
3. Purkait, "Electrical & Electronics Measurement & Instrumentation", TMH
4. Ogata K, "Modern Control Engineering ", Prentice Hall
5. KUO B.C, "Automatic Control System", Prentice Hall
6. Nagarath & Gopal, "Control System Engineering," Wiley Eastern
7. Bakshi & Goyal. Feedback control system, Technical publication.

Experiment's:

1. To determine speed torque characteristics of armature controlled D.C. servomotor.
2. To determine the speed torque characteristics and relationship between torque speed and control winding voltage by AC servomotor.
3. To obtain the step response transient characteristics of first order electric system and to measure system parameters.
4. To plot the nyquist plot of a given transfer function using matlab.
5. To plot the bode plot of a given transfer function using matlab

